

Acoustic Horizontal Coherence and Beamwidth Variability Observed in ASIAEX (SCS)

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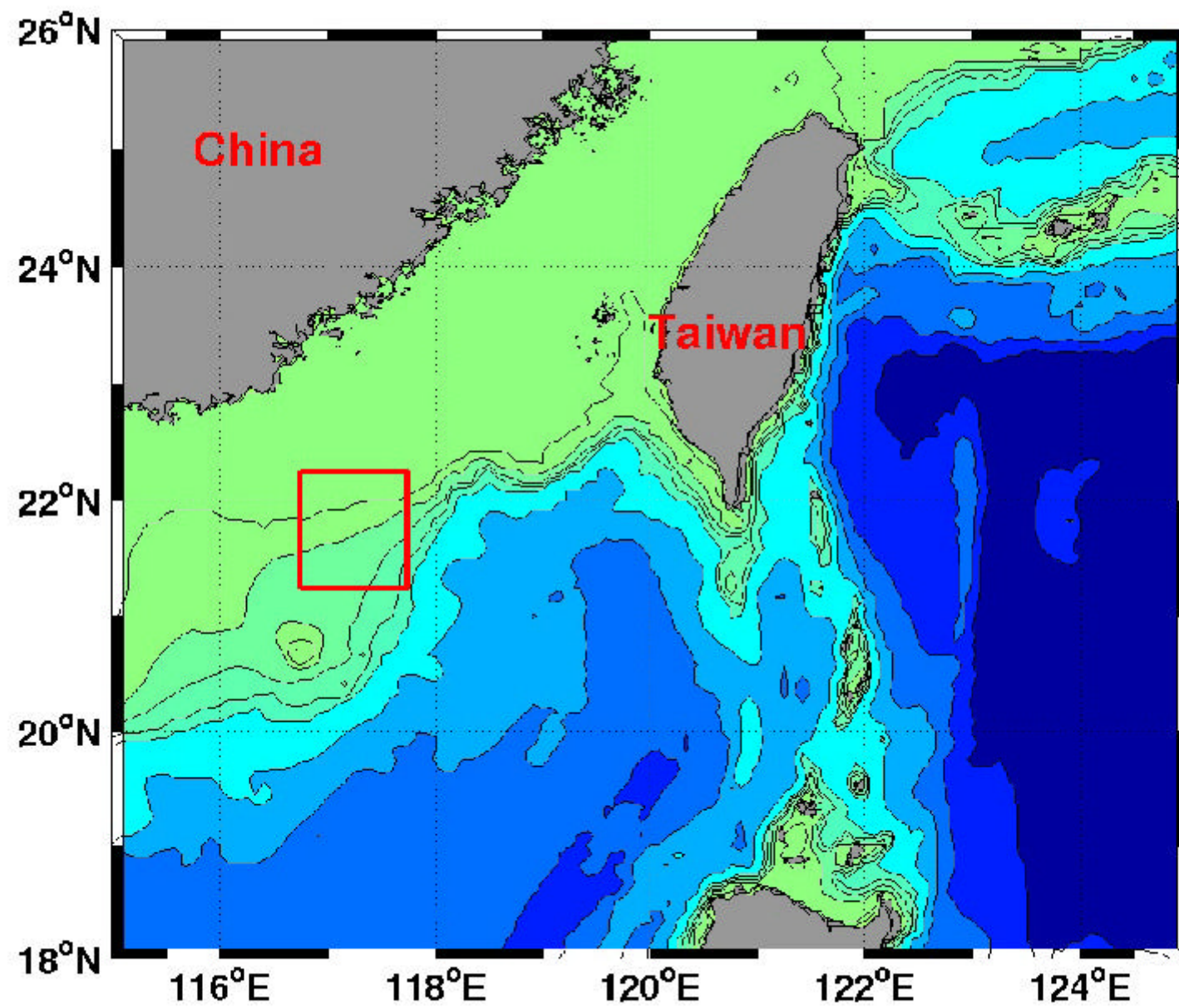
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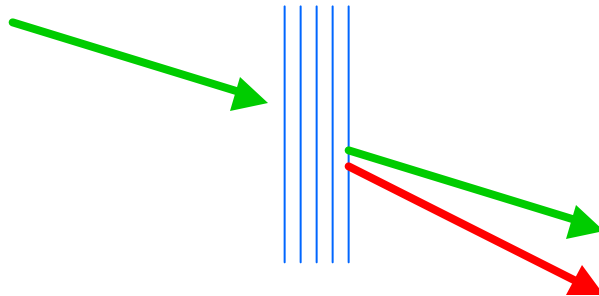
GOALS

**Relate Acoustic Coherence to Water Column
Inhomogeneity and Anisotropy**

**Contrast Coherence under Isotropic and Anisotropic
Conditions**

Coupling-induced Refraction

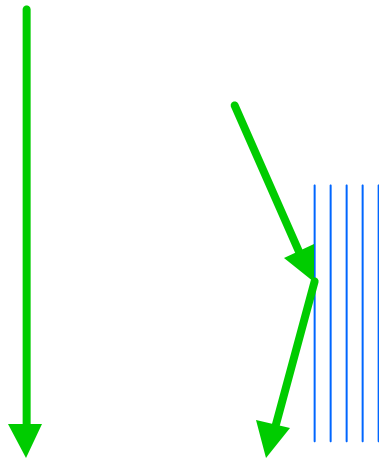
Independent of array orientation
Strongly dependent on IW orientation



Large Incidence Angle:
Coupling to mode with
different phase speed

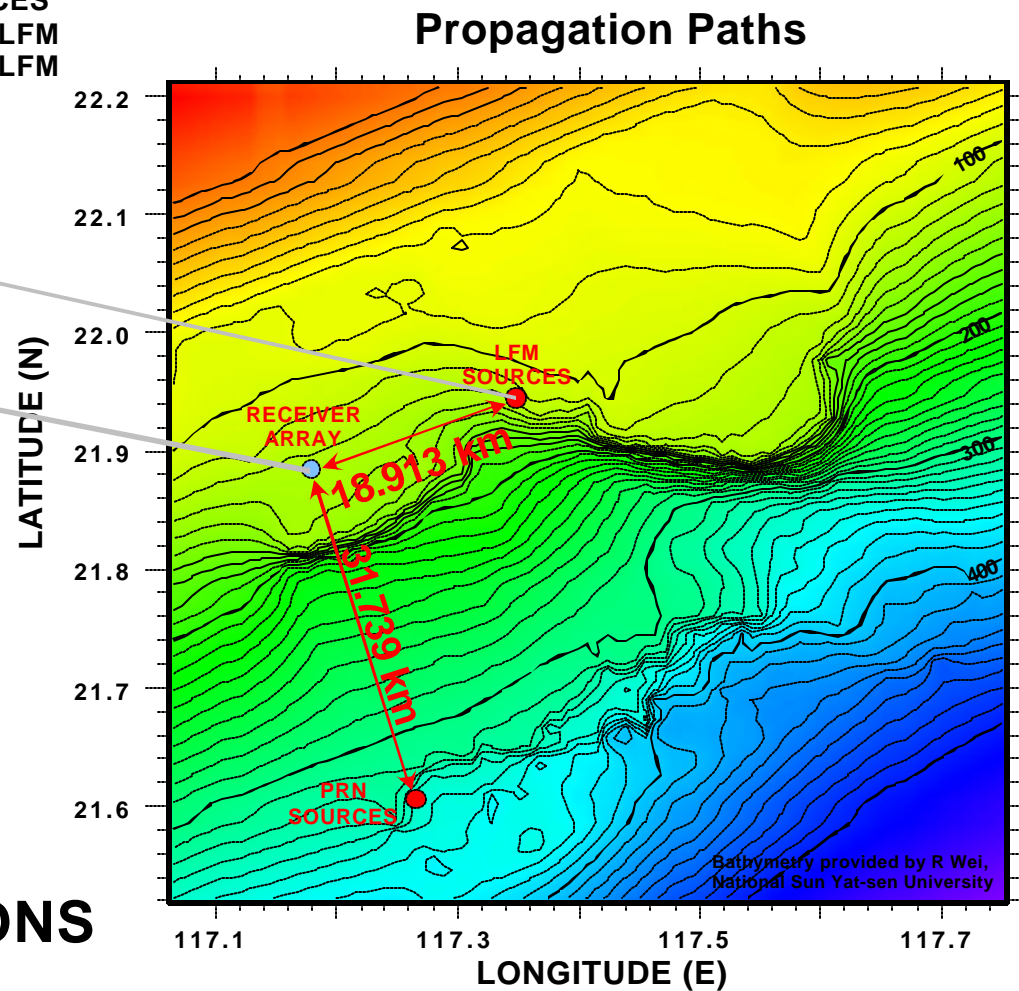
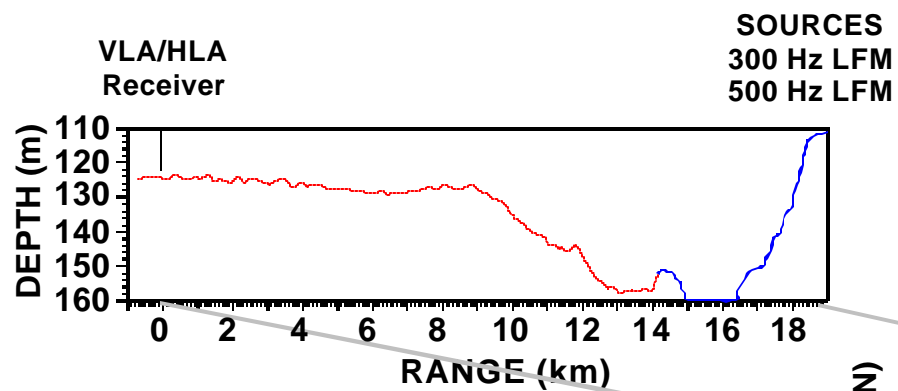
$$\sin \phi_2 = \sin \phi_1 C_2 / C_1$$
$$\delta\phi \sim (C_2/C_1) - 1$$

Adiabatic Refraction – near grazing incidence

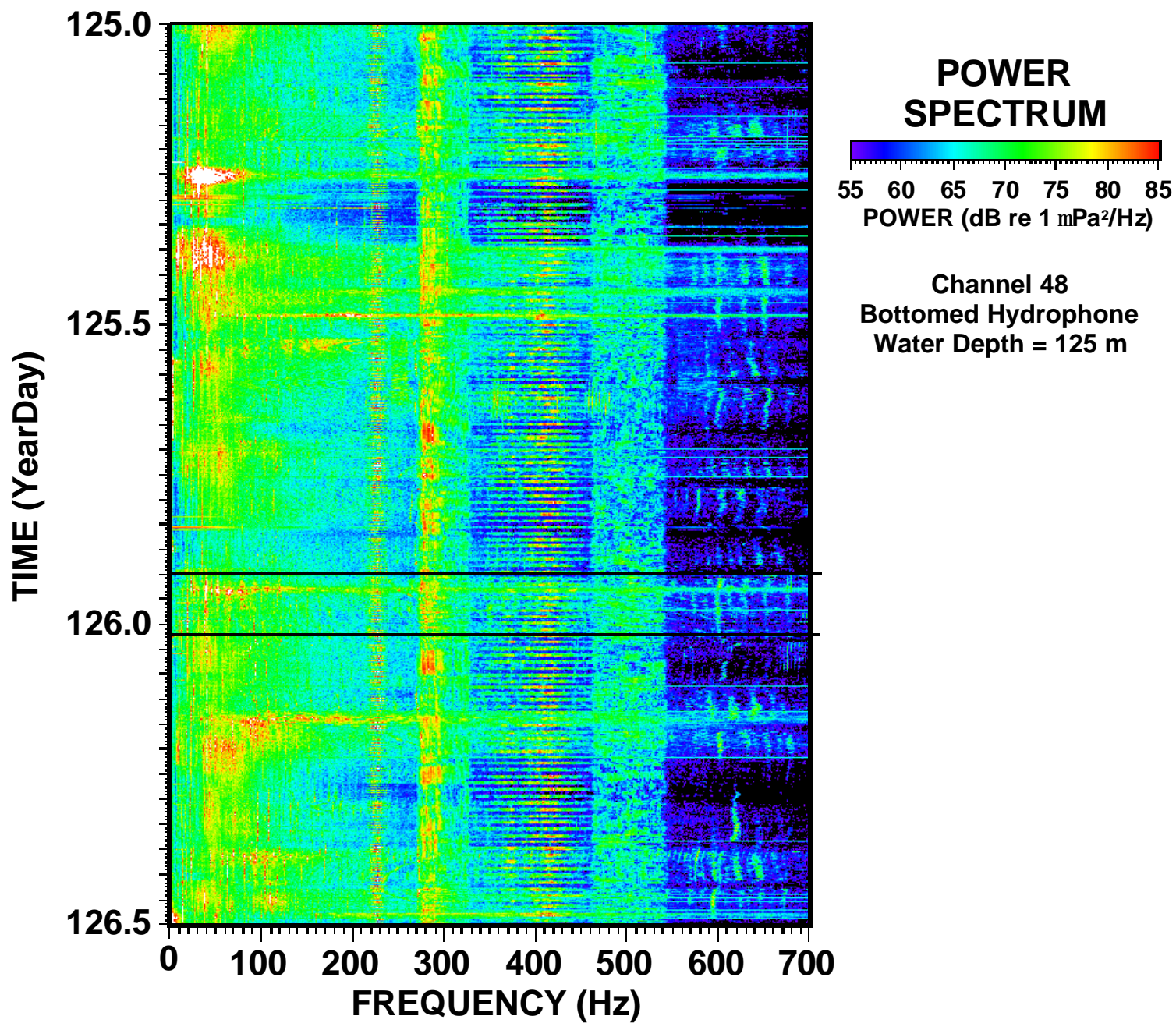


Small Incidence Angle:
Refraction due to local
change in modal phase
speed

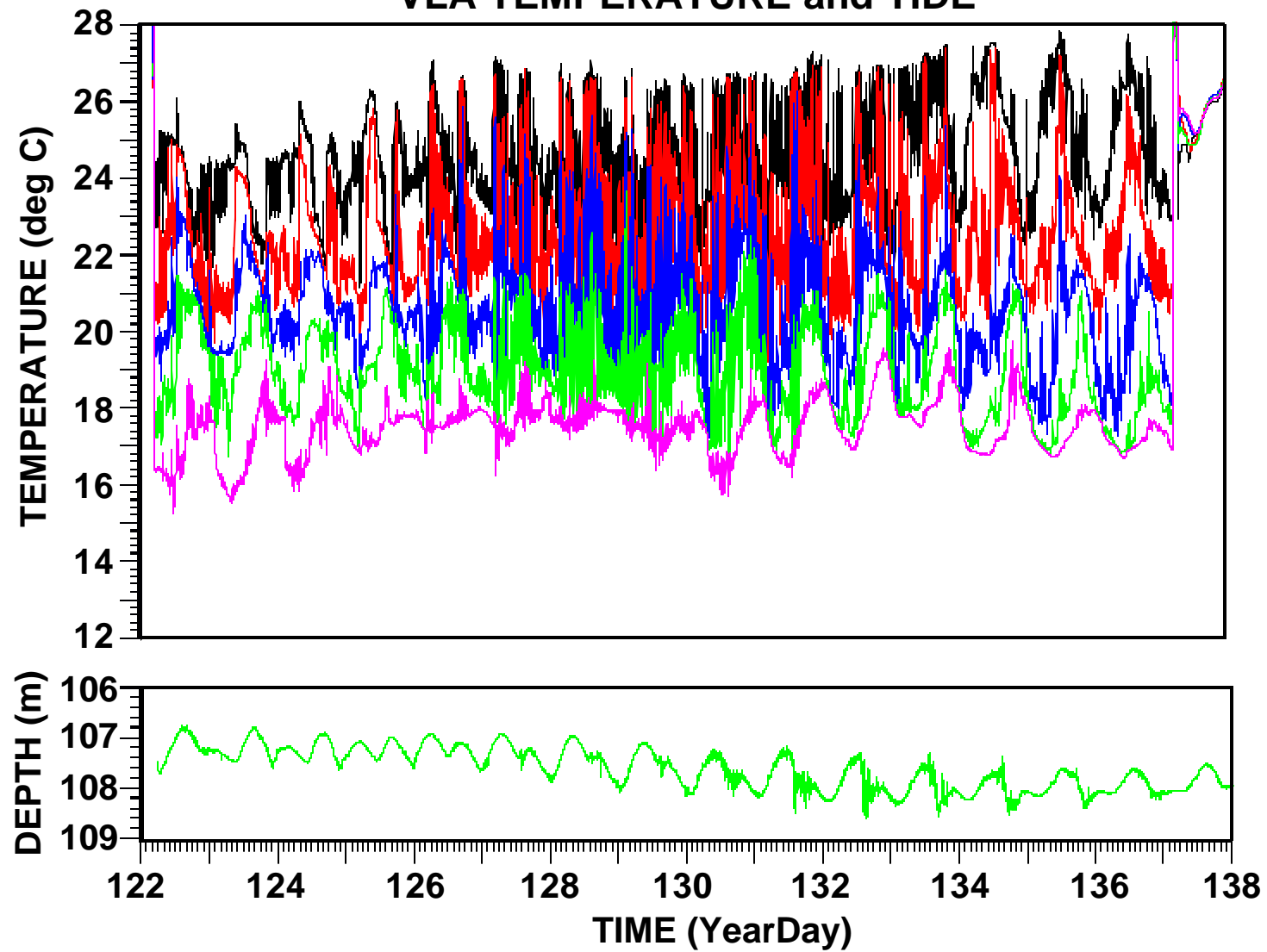
$$\cos(\delta\phi/2) < C_1 / C'_1 ; C' > C$$



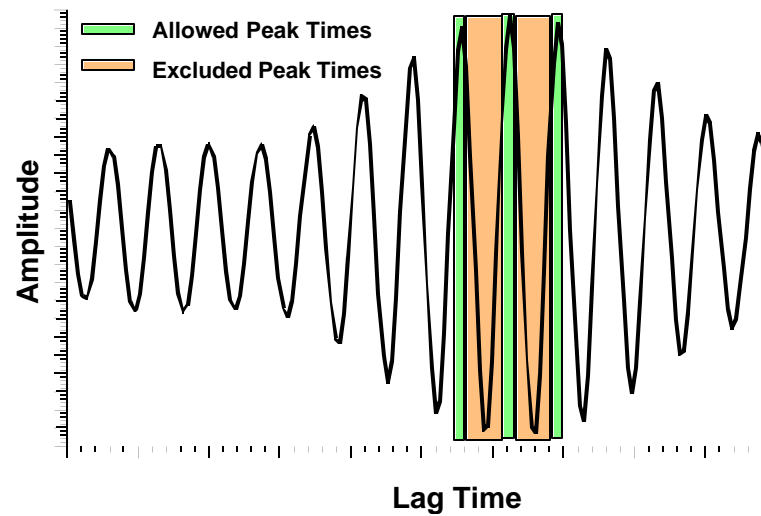
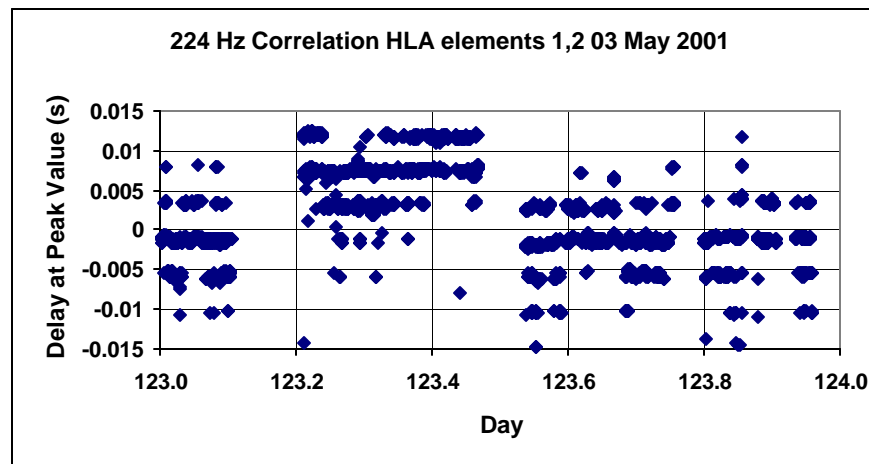
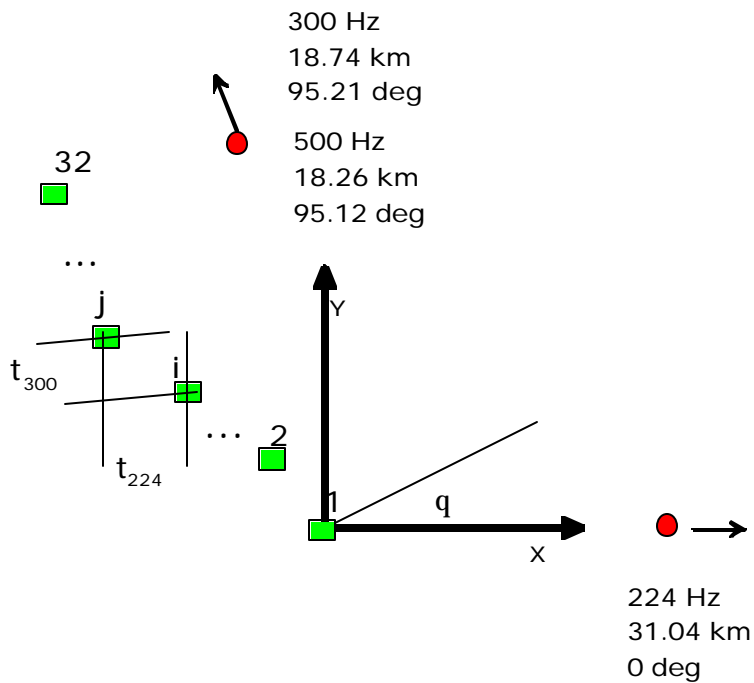
ASIAEx 01 ACOUSTIC ASSET LOCATIONS SITE BATHYMETRY

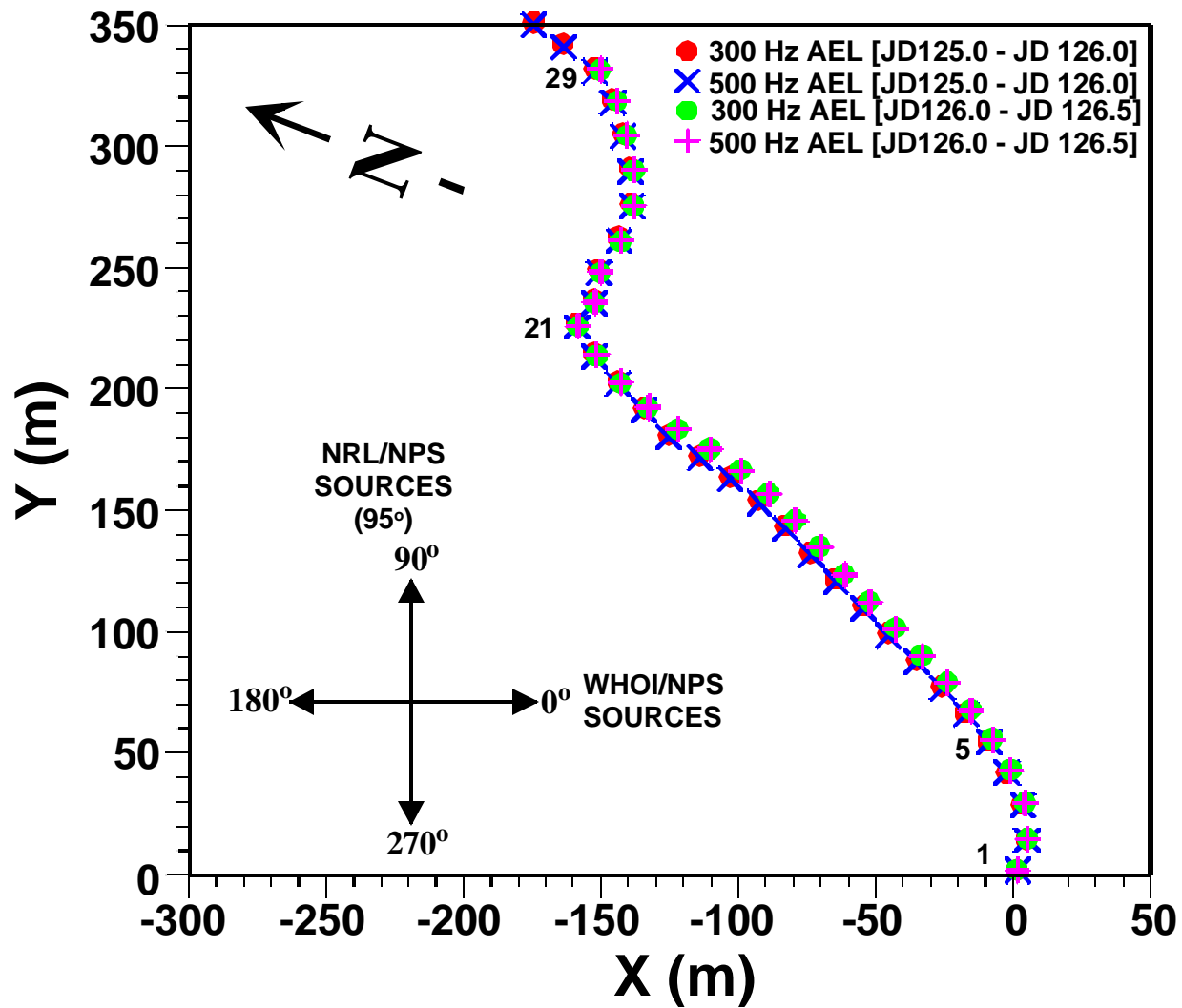


VLA TEMPERATURE and TIDE



Array Element Localization



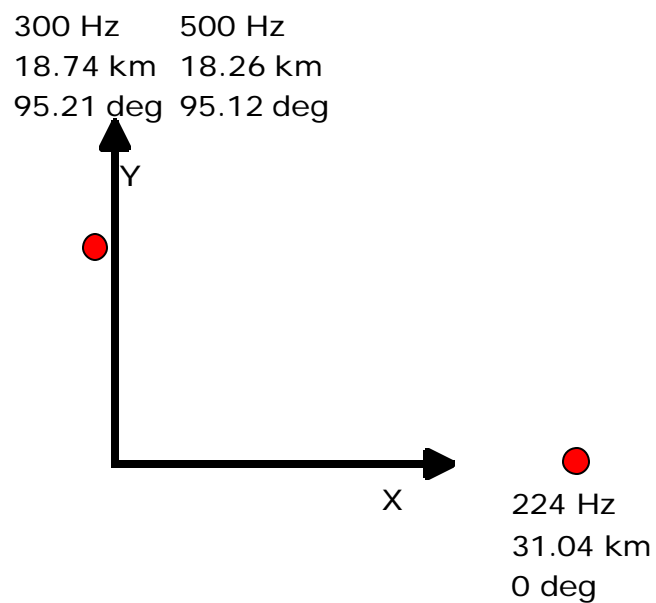


**Localizations valid
for periods of hours
to ~ 1 day**

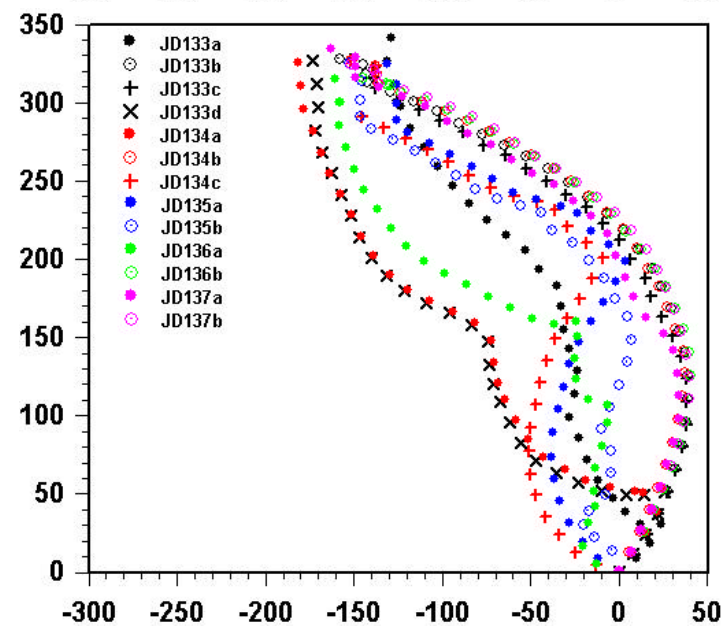
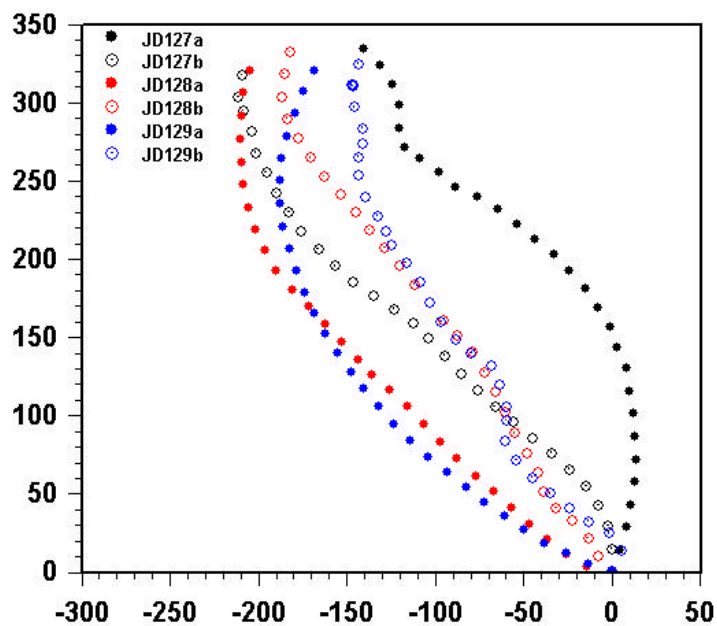
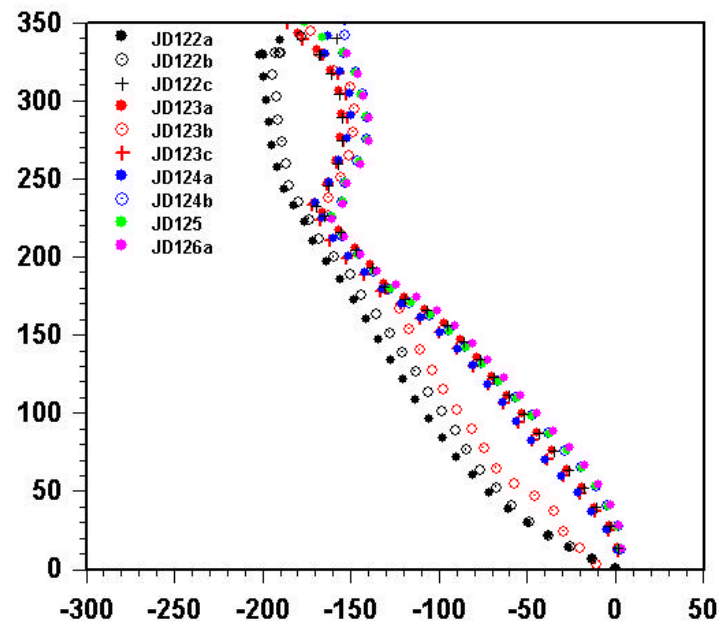
**Good (0.4 m typical)
agreement at 300/500 Hz**

**Agreement with light bulb
implosion localization**

**Motion smallest early
in recording period**



ELEMENT LOCATION RELATIVE TO CHANNEL W17



Numerical Testing

Nearfield corrections not required

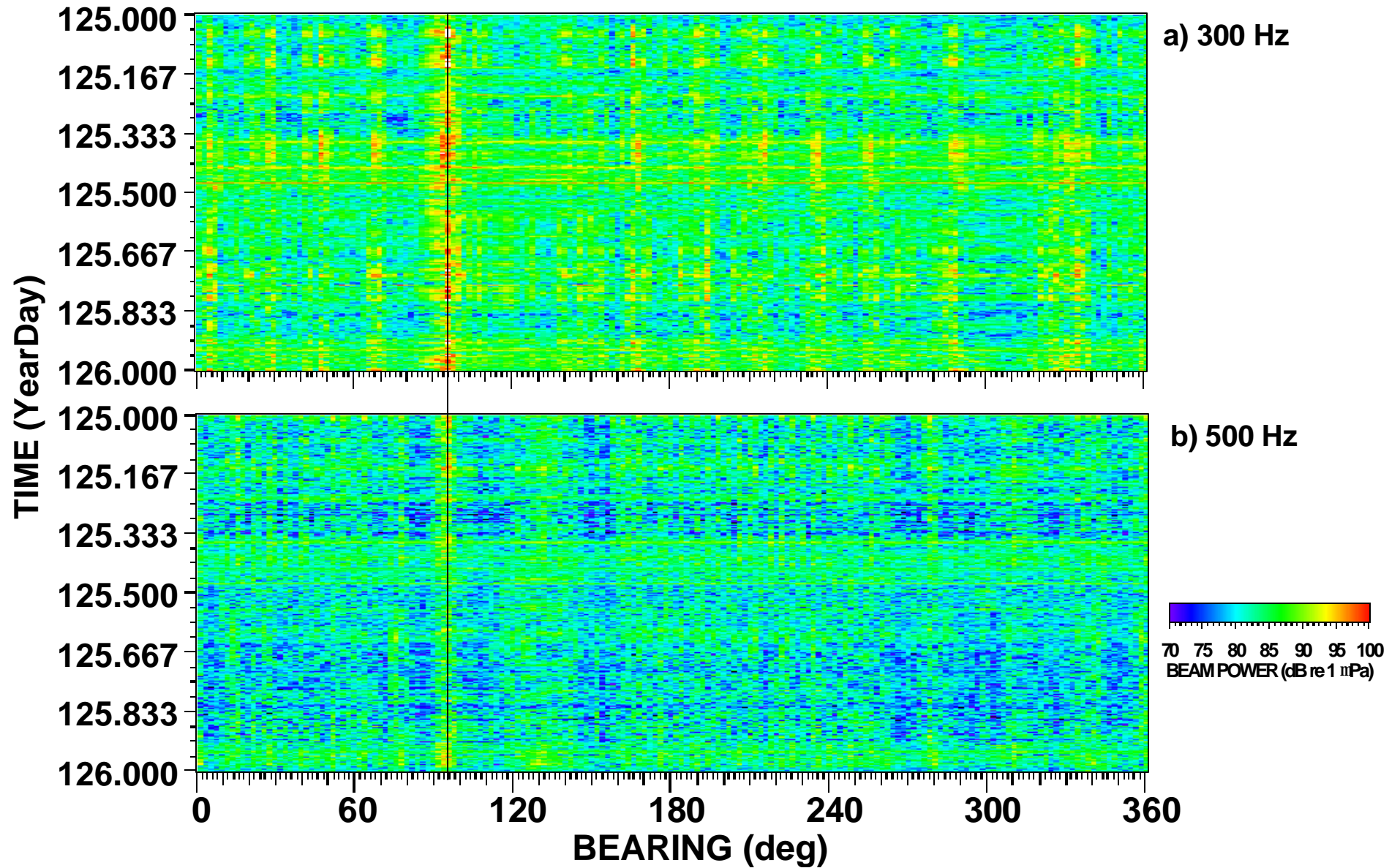
**ASG and resolution can be calculated using
plane wave field**

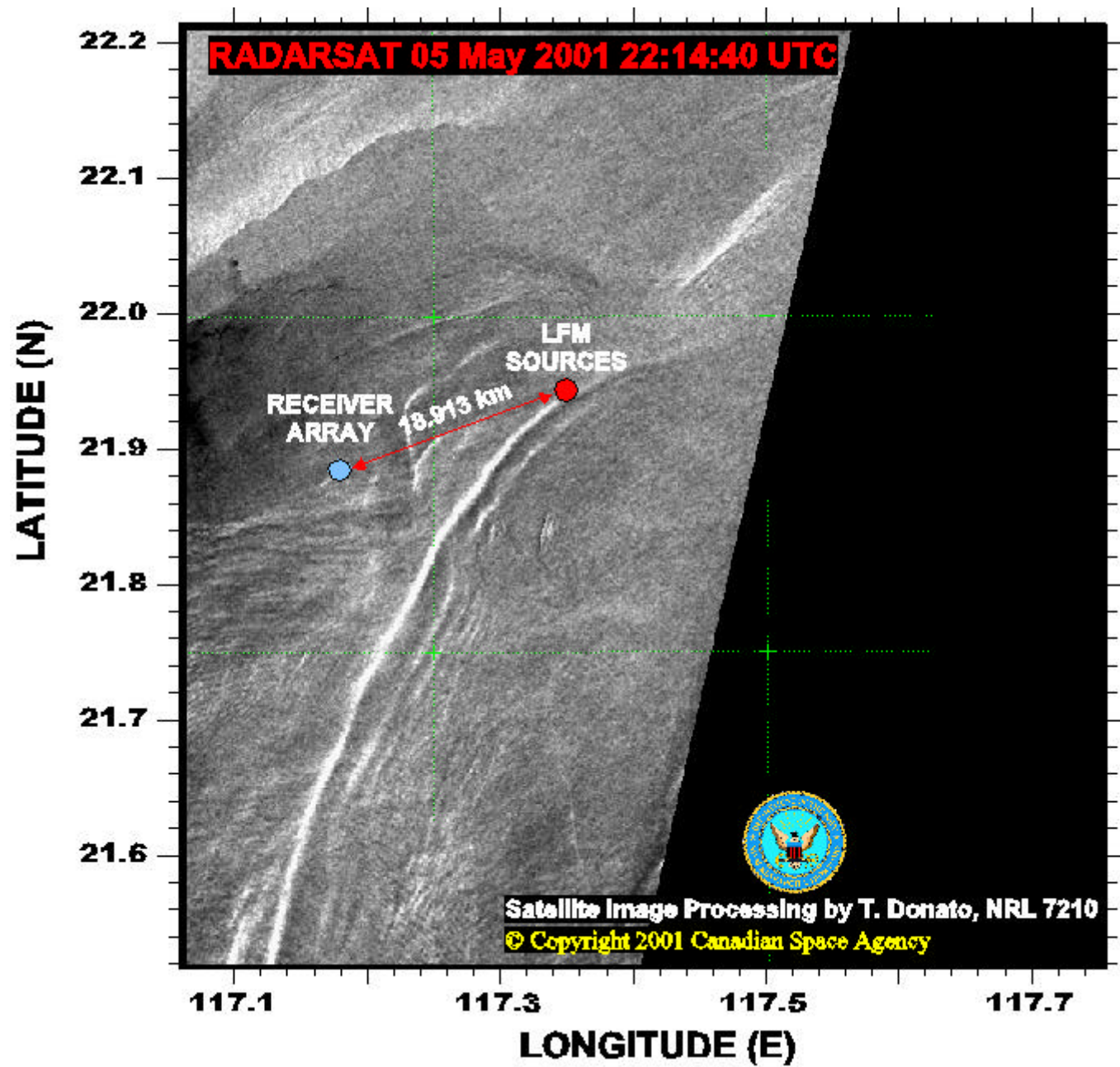
Bearing bias due to phase speed mismatch

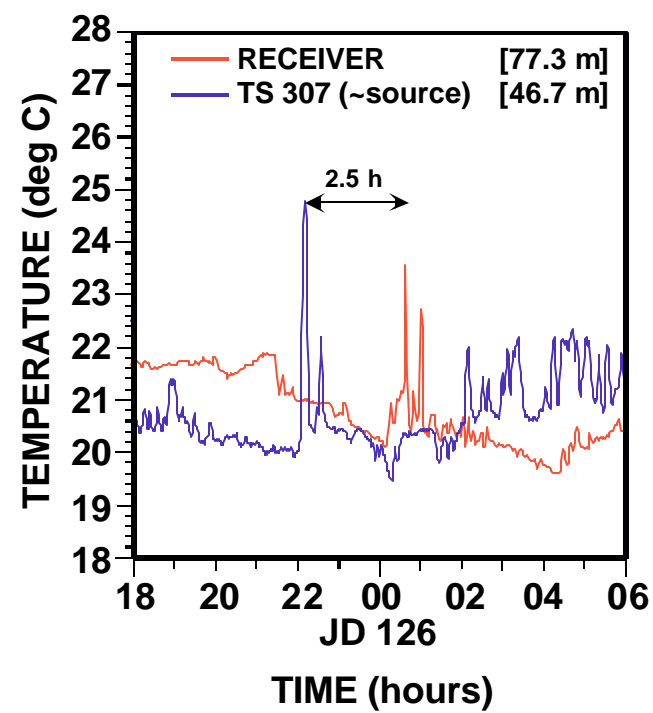
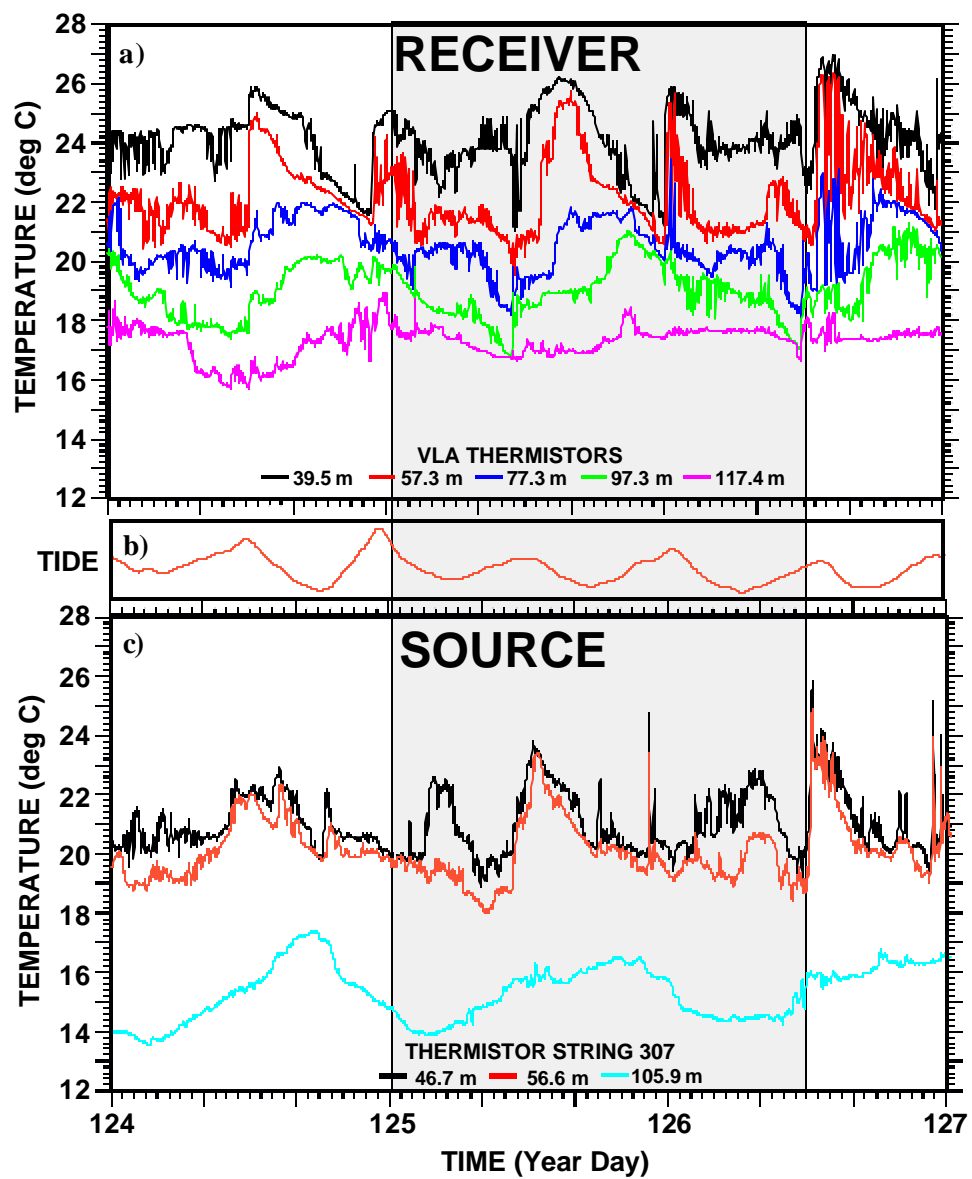
Can use plane wave field calculation

**Planar shape removes grating lobe
ambiguity**

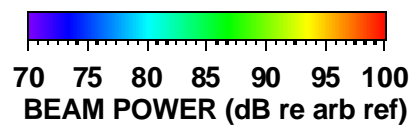
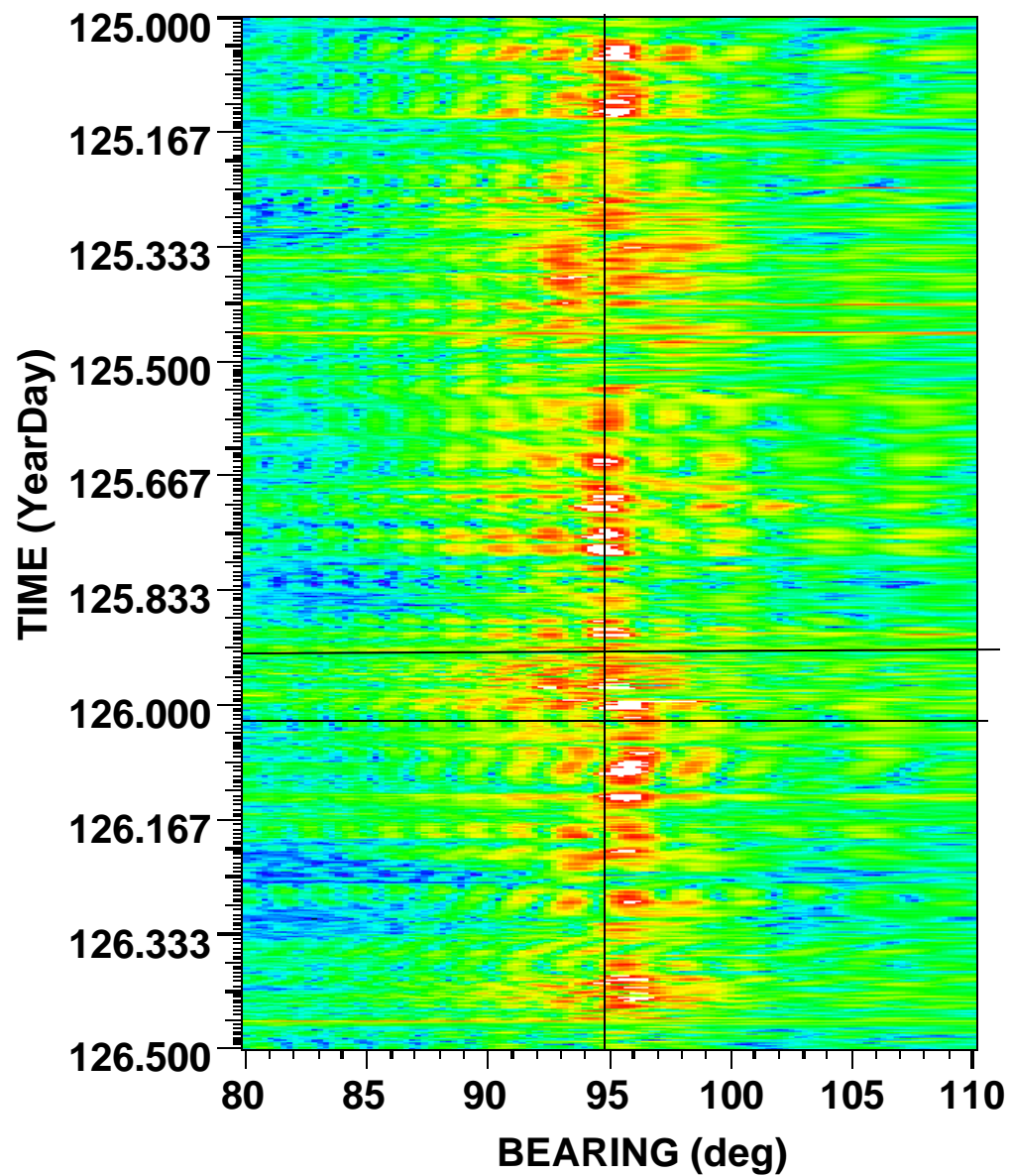
CONVENTIONAL LINEAR BEAMFORM

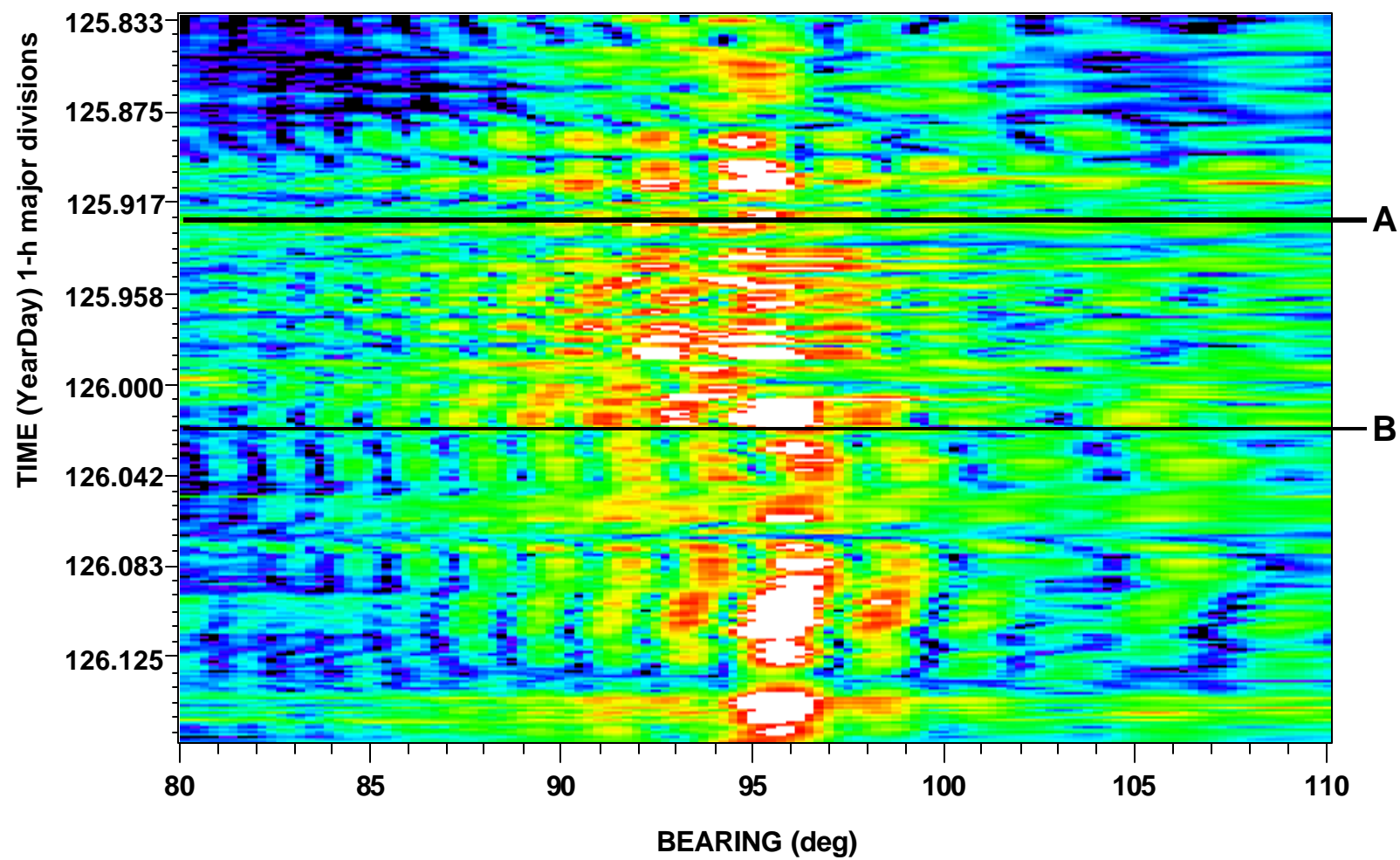


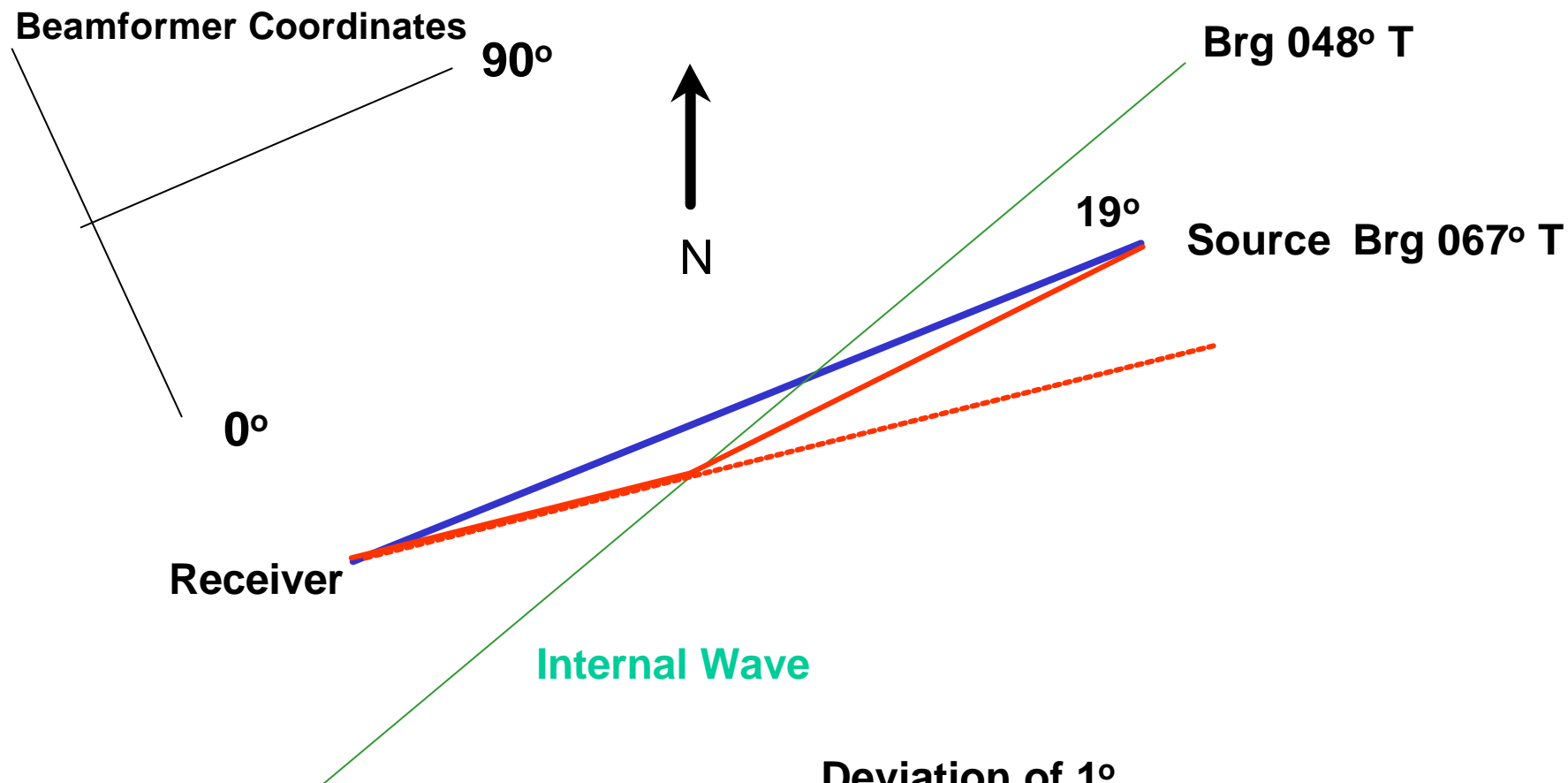




CONVENTIONAL LINEAR BEAMFORM



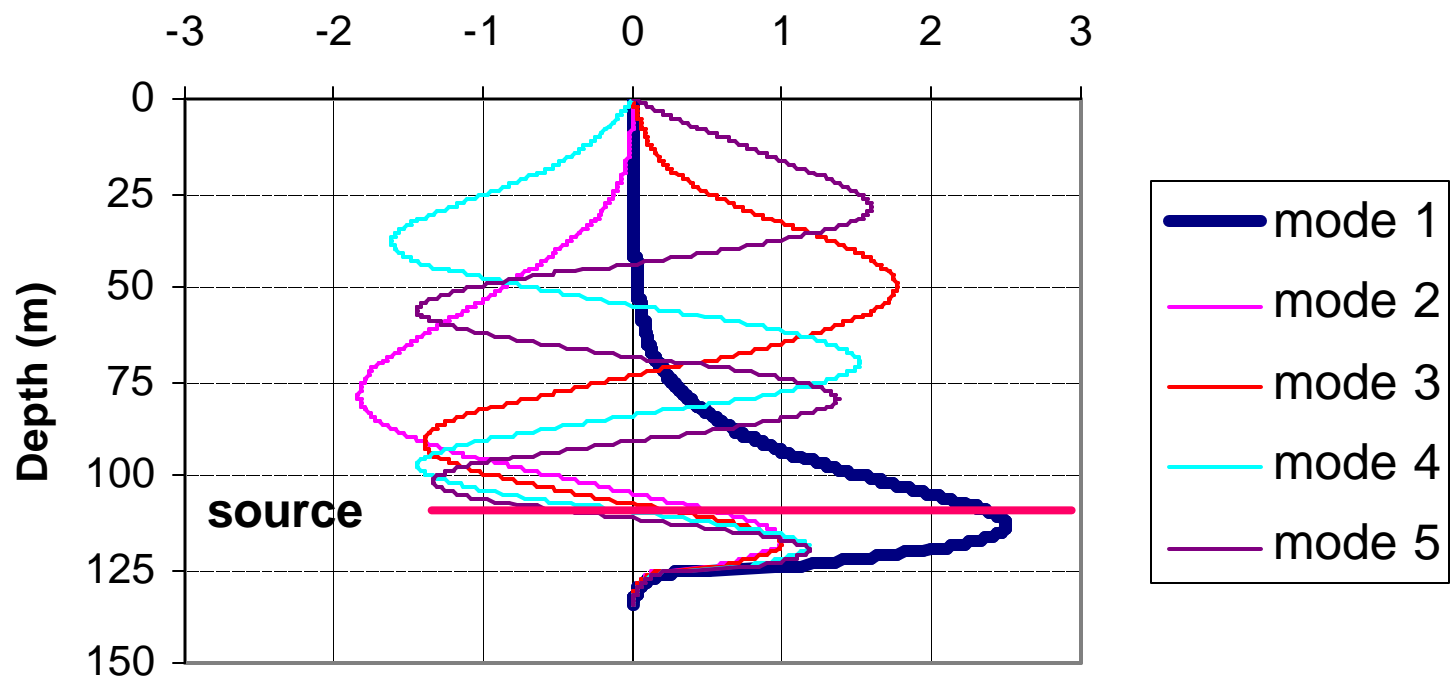




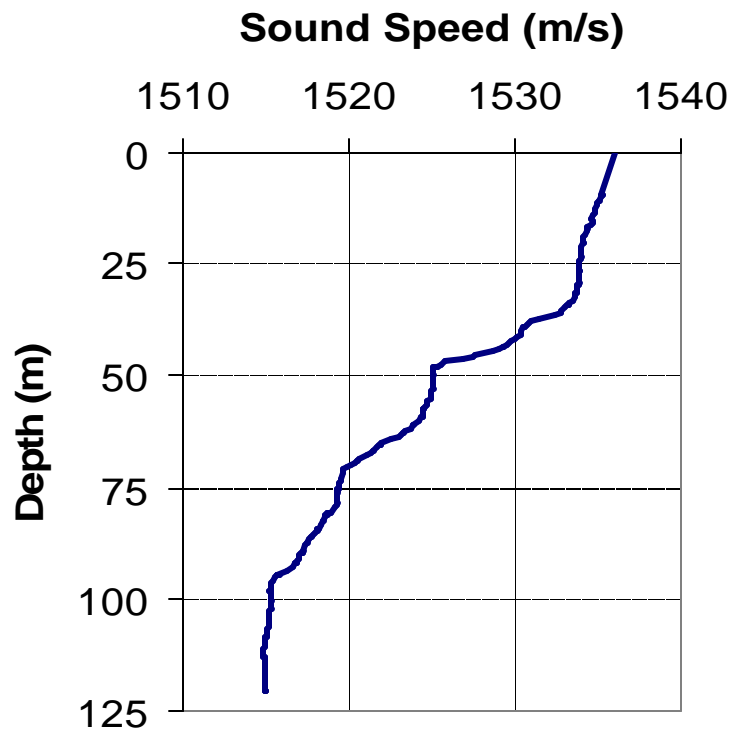
Deviation of 1°
Observed at 2300Z
5 May 2001
Requires ~ 10 m/s
Phase Speed Decrease

JD125.4 2001 profile

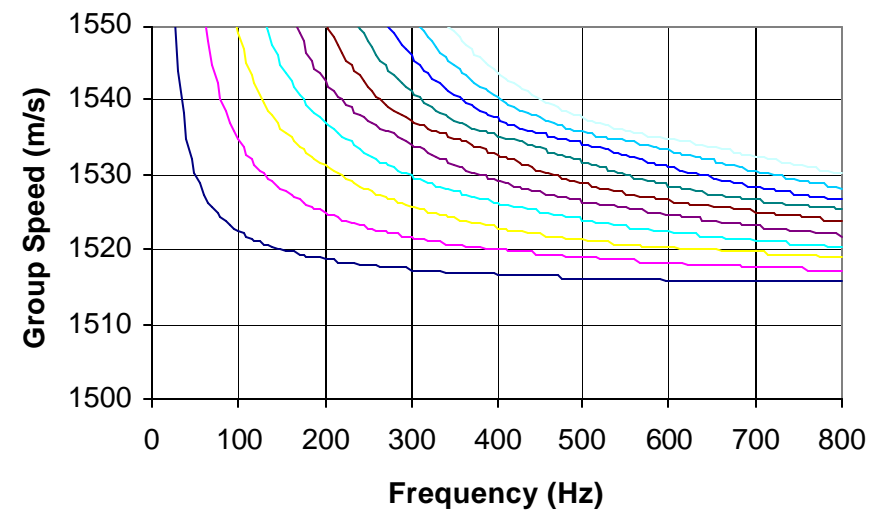
Mode Amplitudes at 300 Hz



CTD cast 1010Z 05 May 01



Phase Speed CTD 1010Z 05May

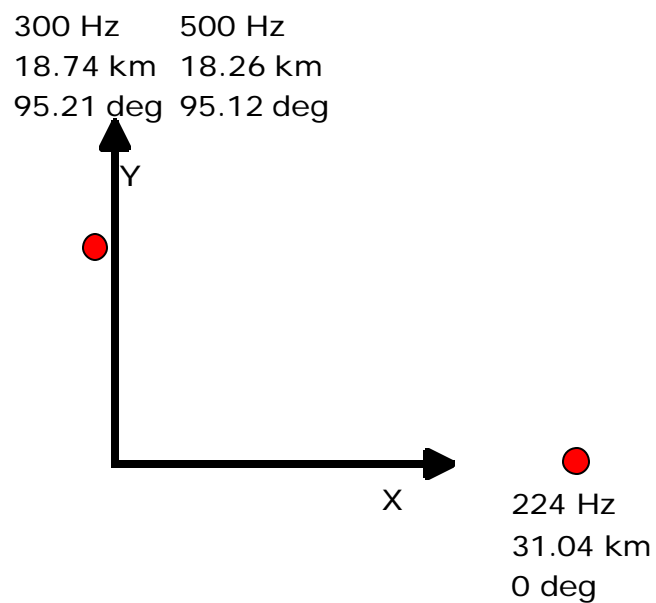


Preliminary Interpretation

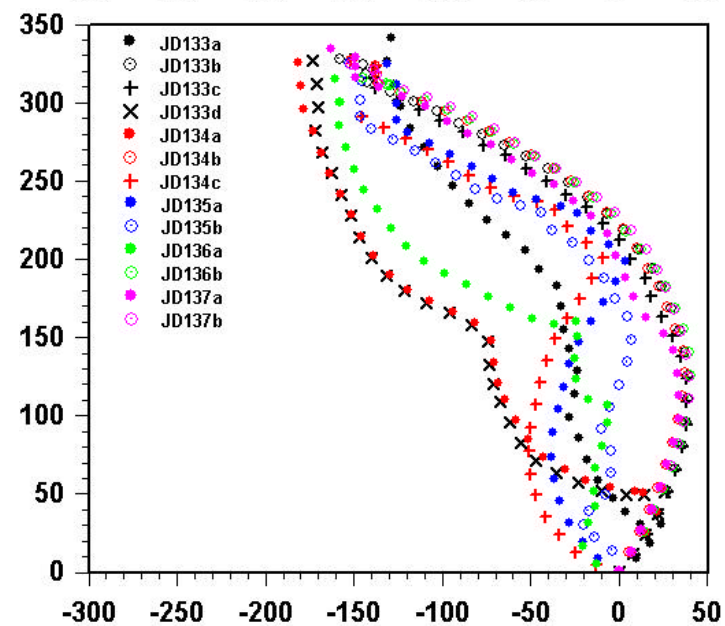
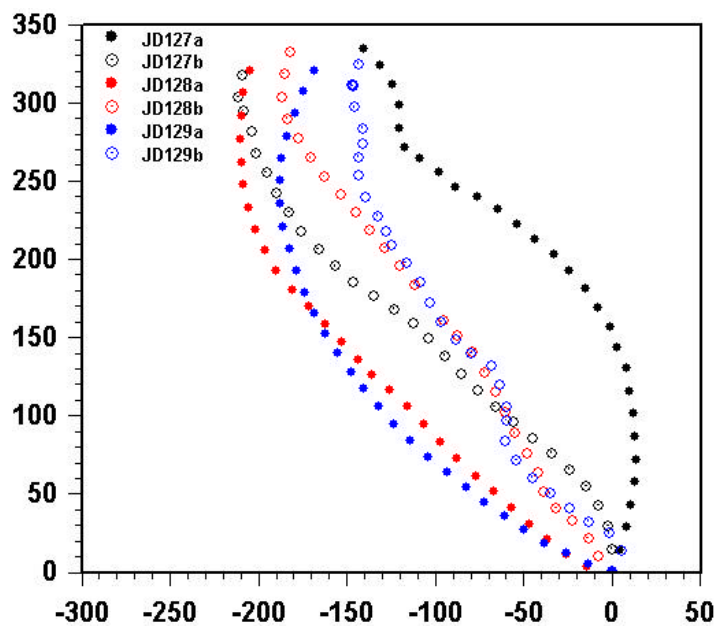
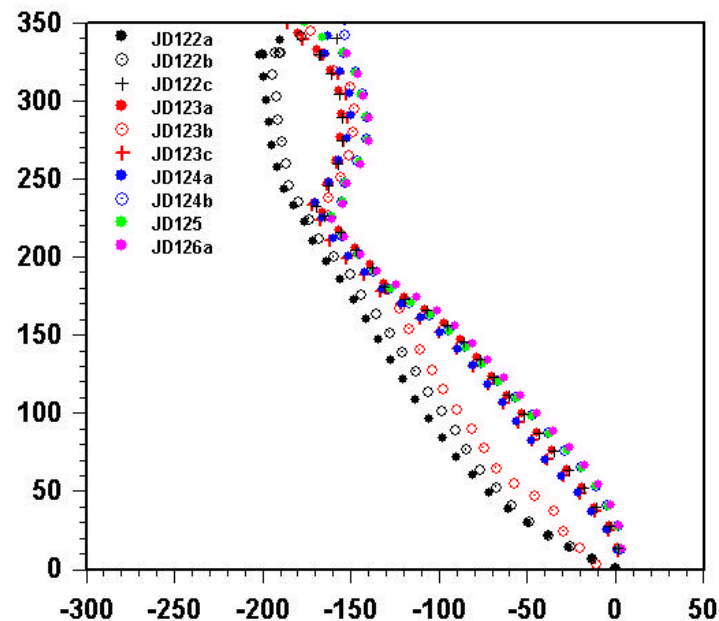
Most of energy in NB beam broadening can be attributed to biases associated with multimode (multiple phase-speed) propagation and non-broadside array

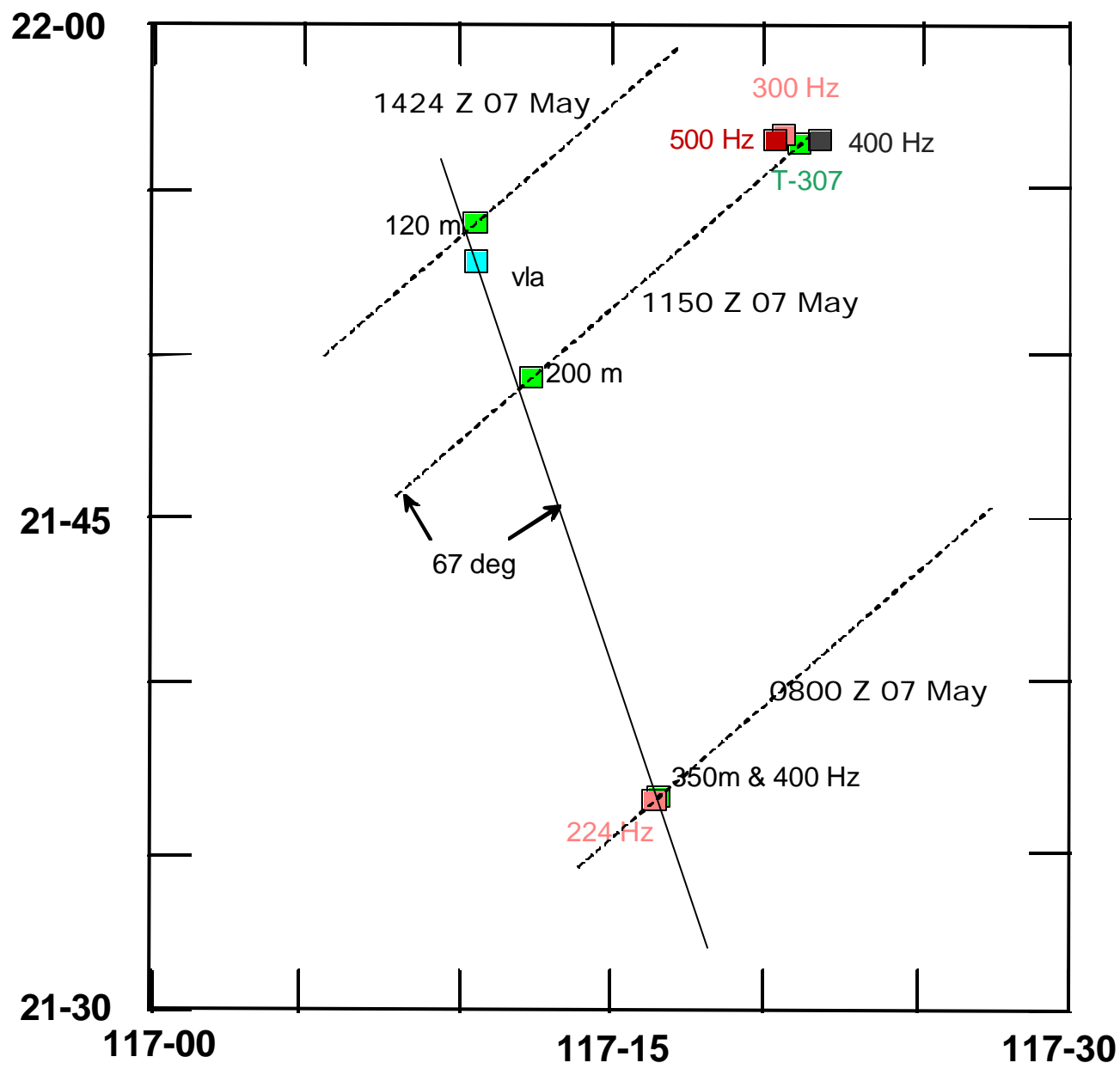
**Some data may indicate refraction during coupling
– work ongoing**

Issues complicating observations would disappear at array broadside

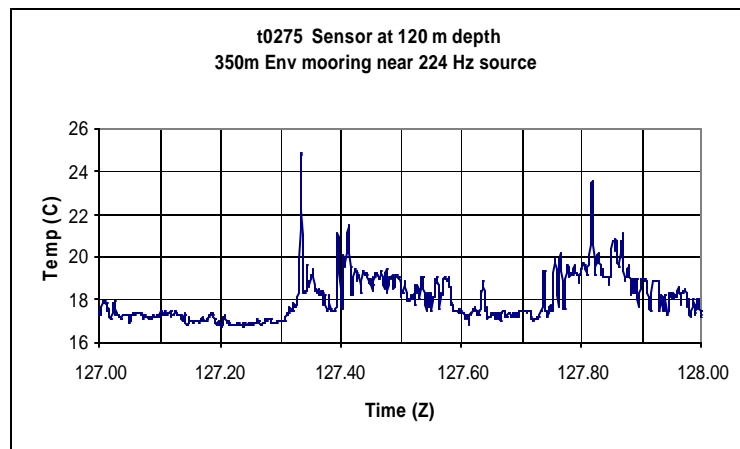


ELEMENT LOCATION RELATIVE TO CHANNEL W17

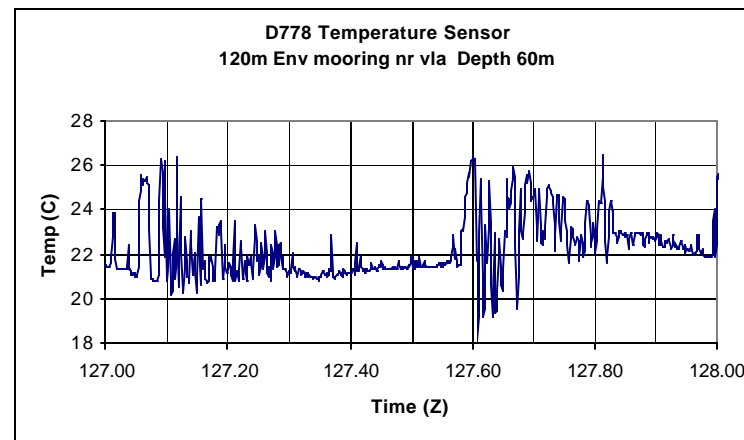




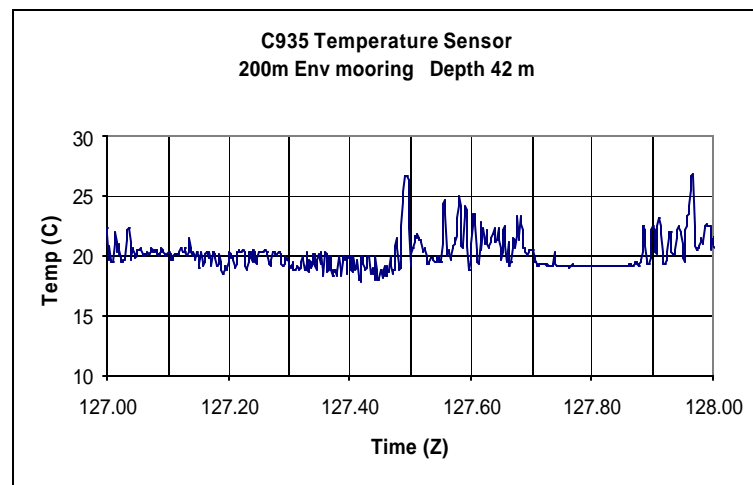
Source



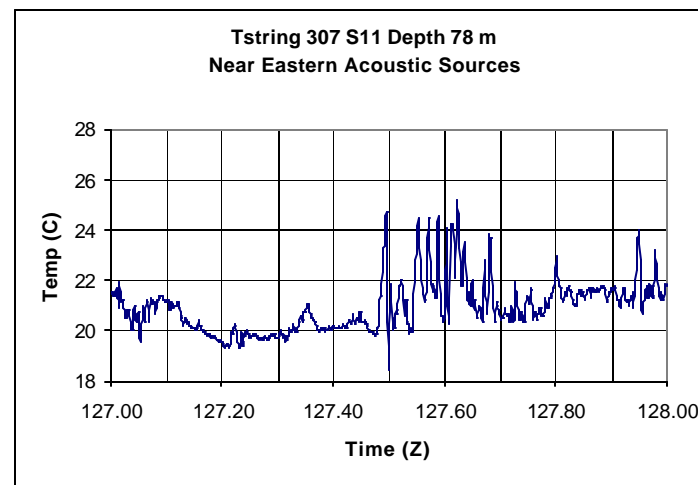
Receiver

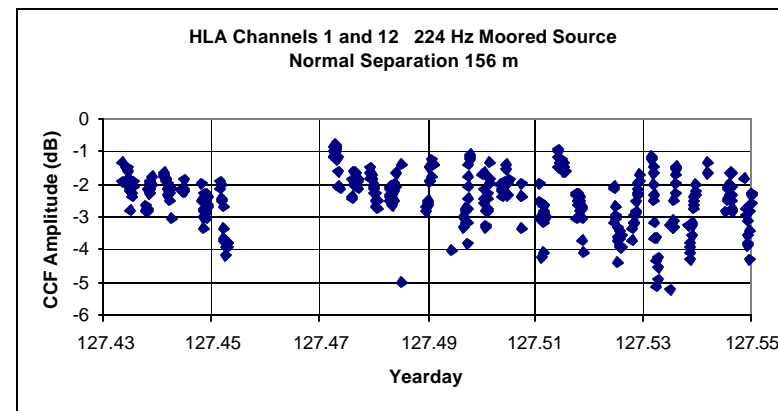
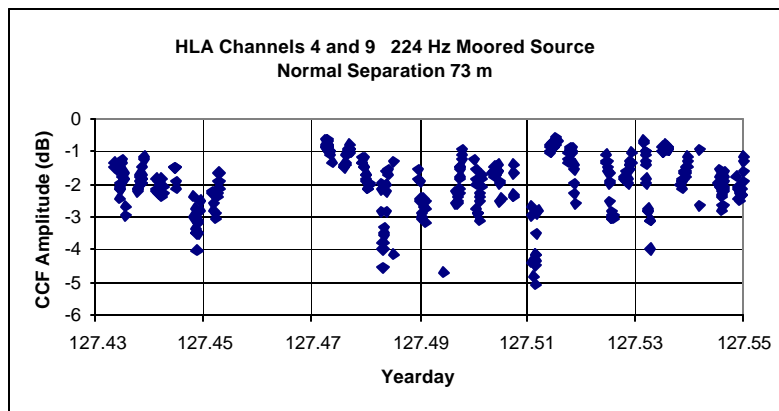
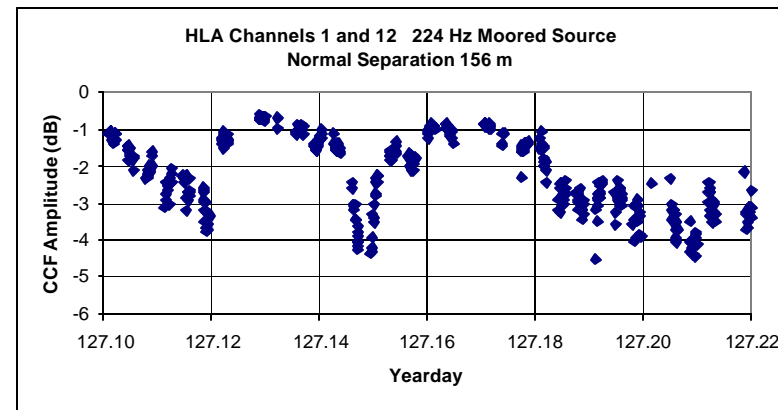
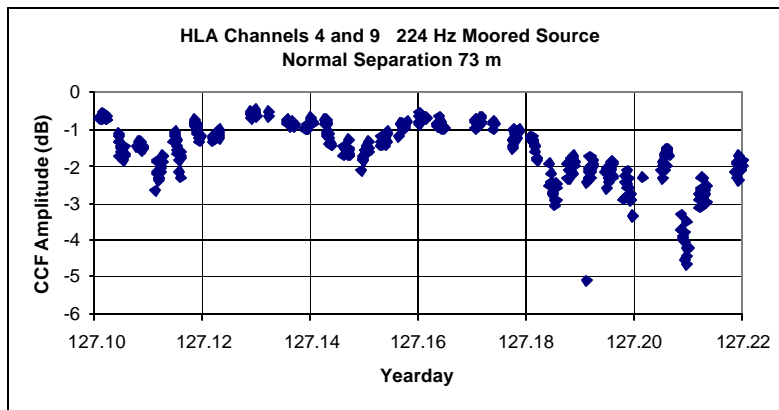


200 m Env



T-string 307





SUMMARY

Array element localizations and beam processing completed for 17 day data set

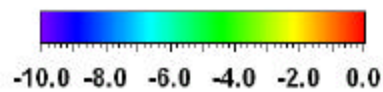
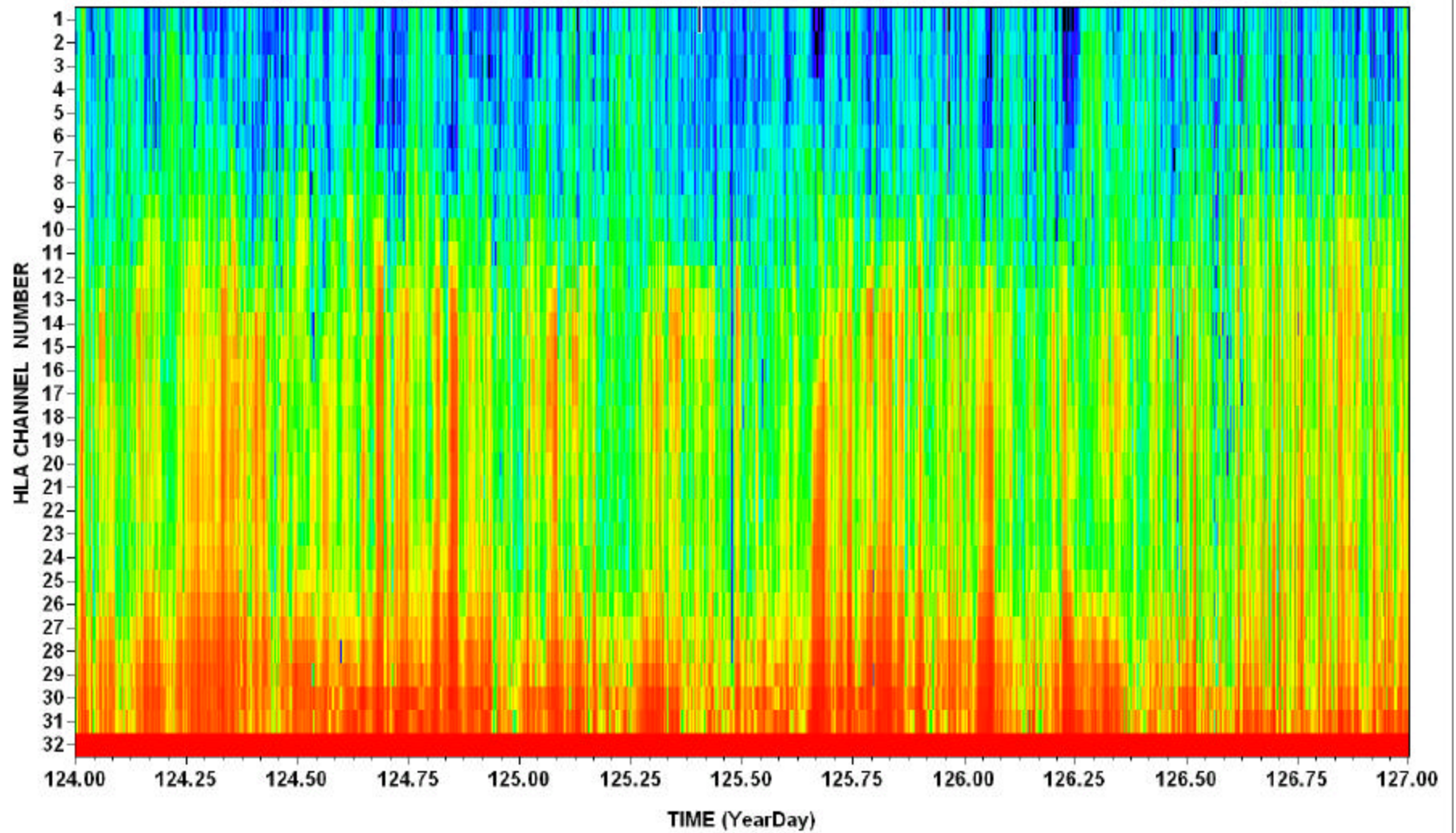
Aperture-limited beamwidths, near-ideal array signal gain found much of the time

Off-broadside narrowband beam broadening appears to be primarily due to multipath wave number differences

Some events may be due to horizontal refraction

Broadside-element cross-correlation suggests long coherence lengths with some fading due to internal waves

CrossCorr_v2 [F= 300 Hz, BW = 70 Hz, Ref = H32]



CROSS CORRELATION PEAK (dB)

